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THE INFLUENCE OF FIBRE ASPECT RATIO ON THE FRACTURE TOUGHNESS OF SFRC

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Abstract

The aim of this study was to observe the influence of fibre aspect ratio on the toughness of steel fibre reinforced concrete (SFRC). In order to achieve the study's aim, SFRC cylinders (300 mm x 150 mm) were prepared and tested under compressive load. Meanwhile, SFRC prisms (750 mm x 150 mm x 150 mm) were also prepared and tested under flexural load. The SFRC cylinders and prisms were prepared from the same batches to achieve the concrete strength of 40 N/mm². As an addition, cube specimens were also prepared to monitor to concrete strength for every batches. All types of specimens were also prepared by using three different fibre aspect ratio (60, 67 and 80) and eight different fibre volume fractions (0.25%, 0.50%, 0.75%, 1.00%, 1.25%, 1.50%, 1.75% and 2.00%). The finding shows that, the smallest fibre aspect ratio, 60 contributed the highest toughness value against the compressive stress, as compared with other larger fibre aspect ratio. A remarkable improvement on the cylinders toughness can be seen starts at $V_f = 0.25\%$ and maximized at a range between $V_f = 1.25\%$ and $V_f = 1.75\%$. Unlike in larger fibre aspect ratio of 67 and 80, their cylinders show lower compressive toughness as compared with 60. Nevertheless, the other way round for the flexural toughness. The largest fibre aspect ratio, 80 contributed the highest toughness value against the flexural stress. Further addition of fibre volume fraction that starts at $V_f = 0.25\%$ and until approach the maximum $V_f = 2.00\%$, shows that the flexural toughness were increased significantly. While other fibre aspect ratios of 60 and 67 shown an increment up to $V_f = 1.00\%$ before dropped at further fibre volume fractions addition.

Keywords: Steel fibre reinforced concrete, Fibre aspect ratio, Fibre volume fraction, Compressive toughness, Flexural toughness.